

CLAIMS

1. A method for detecting a biological particle from gaseous sample, the method
5 comprising the steps of:

10 a) providing a sample chamber and a first and a second electrode, the first and the second and the sample chamber being so positioned that at least a part of the sample chamber is between the first and the second electrode, a distance between the first and the second electrode being at most 20 mm,

b) providing a gaseous sample in the sample chamber,

15 c) applying an first potential to the first electrode and a second potential to the second electrode, thus resulting in a potential difference and an electric field between the first and second electrode, to assist electrostatic collection, in the sample chamber, of a biological particle from the gaseous sample,

20 d) contacting the collected biological particle with a first liquid reagent, thus obtaining the reaction mixture,

e) exposing said reaction mixture to an alternating electric field in said sample chamber, said alternating electric field having a sufficient amplitude so as to enable extraction of biological material from the biological particle,

25 f) performing nucleic acid amplification of a target nucleic acid sequence

30 g) measuring the presence of the amplified target nucleic acid sequence and/or products resulting from amplification of the target nucleic acid sequence and optionally inferring that the biological particle has been detected in the sample if at least the one copy of amplified target nucleic acid sequence is present and/or if at least one product resulting from amplification of the target nucleic acid sequence is present.

35 2. The method according to claim 1 wherein the first and the second electrode are positioned at opposing sides of the sample chamber.

3. The method according to any of the preceding claims, wherein the first liquid reagent comprises one or more reagents required to perform a nucleic acid amplification.

40 4. The method according to any of the preceding claims, wherein the first liquid reagent comprises one or more reagents selected from the group consisting of a primer, a triphosphate nucleotide and a polymerase.

5. The method according to any of claims 1-4, wherein the first liquid reagent furthermore comprises a 5'-3' exonuclease degradable, oligo-nucleic acid probe, the degradation of said nucleic acid probe resulting in release of a redox active component.
- 5 6. The method according to claim 5, wherein the redox active component is a metallocene such as e.g. ferrocene.
7. The method according to any of the preceding claims, wherein the nucleic acid
10 amplification of step f) is performed using an amplification technique selected from the group consisting of Polymerase Chain Reaction techniques (PCR), Strand Displacement Amplification (SDA), Ligation-Rolling Circle Amplification (L-RCA) and their combinations/modifications.
8. The method according to claim 7, wherein the nucleic acid amplification of step f) is PCR.
- 15 9. The method according to claim 8, wherein the nucleic acid amplification of step f) is nested PCR, preferably single-tube nested PCR.
10. The method according to any of the preceding claims, wherein the measurement of
20 step g) comprises a voltammetric measurement.
11. The method according to claim 10, wherein the voltammetric measurement is performed using differential pulsed voltammetry or other means for reference signal subtraction to increase the signal to noise ratio.
- 25 12. The method according to claim 10 or 11, wherein the voltammetric measurement is performed using detection electrodes positioned in the sample chamber.
13. A chip for detecting a biological particle from a gaseous sample, the method
30 comprising the steps of:
- a sample chamber with a first opening in fluid connection with the surrounding air and a second opening to form a fluid connection with a device, the sample chamber comprising a gaseous sample,
 - a first and a second electrode positioned at opposing sides of the sample chamber,
 - 35 - a heating electrode,
 - a temperature sensing element,
 - a detection electrode.
14. A device for detecting a biological particle from a gaseous sample, the device
40 comprising:
- a chip site where a chip is to be located in order be functionally associated with the device,
 - an electrical interface between the device and the chip for applying an alternating electric field between a first and a second electrode of the chip or the device, and

- a programmable unit comprising a software that effects that the device performs one or more actions selected from the group consisting of:
 - providing a gaseous sample in the sample chamber,
 - applying an first potential to the first electrode and a second potential to the second electrode, thus resulting in a potential difference and an electric field between the first and second electrode, to assist electrostatic collection, in the sample chamber, of a biological particle in the gaseous sample,
 - contacting the collected biological particle with a first liquid reagent,
 - exposing a reaction mixture to an alternating electric field in said sample chamber, said alternating electric field having a sufficient amplitude so as to enable extraction of biological material,
 - performing nucleic acid amplification of a target nucleic acid sequence,
 - measuring the presence of the amplified target nucleic acid sequence and/or measuring products resulting from amplification of the target nucleic acid sequence.
15. A system for detecting a biological particle, the system comprising a chip according to claim 13 functionally associated with a device according to claim 14.